

Biological Assessment Report

Big Creek Iron County

March 27, and September 20, 2000

Prepared for:

Missouri Department of Natural Resources
Division of Environmental Quality
Water Pollution Control Program

Prepared by:

Missouri Department of Natural Resources
Division of Environmental Quality
Environmental Services Program

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1.0 Introduction

As part of the Environmental Services Program's (ESP) biological criteria development, a biological assessment of Big Creek below the Doe Run Company Glover Smelter, Division MO-0001121 was conducted. One site was sampled on March 27, 2000 and again on September 20, 2000. The sampling site is located within a four-mile segment of Big Creek that is on the 303(d) list of impaired waters for metals contamination from the Doe Run lead smelting facility. Brian Nodine, Sam McCord, and Ken Lister of the Division of Environmental Quality, ESP, conducted the sampling.

2.0 Study Area

Big Creek originates in Iron County near Taum Sauk Mountain. Big Creek is listed in the Missouri Water Quality Standards as a class "P" stream for thirty-two miles from its confluence with the St. Francois in Wayne County and as a class "C" stream at its uppermost half mile. Beneficial use designations for the thirty-two mile class "P" segment are "warm water aquatic life protection, human health/fish consumption, cool water fishery, whole body contact recreation, boating and canoeing, and livestock and wildlife watering". Beneficial uses for the half mile class "C" segment are "warm water aquatic life protection and livestock and wildlife watering".

Big Creek is located within the Ozark/Little Ecological Drainage Unit (EDU). An EDU is a region in which biological communities and habitat conditions can be expected to be similar. Please see Appendix A for a map of the EDU and the sampling location.

Table 1 compares the land cover percentages from the Ozark/Little EDU and the 14 digit Hydrologic Unit (HU), #08020202040001 containing the sampling location. Land cover data were derived from Thematic Mapper (TM) satellite data from 1991 to 1993 and interpreted by the Missouri Resource Assessment Project.

Table 1
Percent Land Cover of HU #08020202040001

	Urban	Crops	Grassland	Forest
EDU	0	3.6	27.9	67
14 digit HU	0	0	6	92.3

3.0 Site Descriptions

The site is located at the upstream side of the Little Creek Road crossing just off Highway 21 (N 1/2 sec. 14, T. 32 N., R. 3 E.) in Iron County. The Doe Run facility is approximately 1.4 miles upstream from the sample station. The stream site was accessed through property owned by Mr. Wayne Tindell.

Stream width averaged about 25 to 30 feet and stream depth in riffle/run areas was approximately 0.5 feet. Discharge measured on March 27 was 24.9 cubic feet per second (cfs) and discharge on September 20 was 0.5 cfs. A substantial quantity of periphyton was present on the depositional substrate. The three standard habitats (coarse substrate, depositional substrate, and rootmat substrate) of a riffle/pool stream as defined in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure were sampled with the exception of rootmat in the fall. Serious streambed alteration discussed in 5.0 and 7.0 compromised the habitat for the fall sample.

4.0 Methods

4.1 Macroinvertebrate Collection

A standardized sample collection procedure was followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure.

4.2 Discharge Measurements

Stream velocity was measured using a Marsh-McBirney, Flo-Mate Model 2000. Discharge was calculated per the methods in the Standard Operating Procedure MDNR-FSS-113 (Flow Measurements in Open Channels).

4.3 Chain-of-Custody

All samples received a numbered label affixed to the sampling jar and an internal label after preservation with formalin. The corresponding label number was entered onto a chain-of-custody form indicating the date, time, and location of collection and parameters to be analyzed. The ESP field personnel maintained custody of the samples for analyses.

4.4 Macroinvertebrate Analyses

A standardized sample analyses procedure was followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure.

4.5 Quality Assurance/Quality Control (QA/QC)

QA/QC procedures were followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure.

5.0 Observations

Big Creek appeared to be at base flow in the spring and lower in the fall. Sometime prior to the fall sampling date, serious alteration to the stream bottom had occurred. The only possible apparent objective to the alteration was to impound that segment of the stream. Because a portion of the segment was impounded, only the lower half of the segment sampled in the spring was wadable and allowed sampling in the fall. The substrate below the impounded area was very loose and appeared to be very recently bulldozed. Only depositional and coarse substrates were sampled in the fall because the alteration eliminated rootmat habitat.

6.0 Results

Data were evaluated as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure and are on file at the MDNR/ESP. The following four metrics were used in the evaluation: 1) Total Taxa (TT); 2) Ephemeroptera/Plecoptera/Trichoptera Taxa (EPTT); 3) Biotic Index (BI); and, 4) Shannon Index (SI). The numeric biological criteria for this evaluation were determined by metric values calculated from reference streams within the Ozark/Little EDU. Those criteria are listed for spring in Table 2 and for fall in Table 3.

Table 2
Biological Criteria metric values for Warm Water Streams in the Ozark/Little EDU (Spring)

	Score = 5	Score = 3	Score = 1
TT	>89	89-45	44-0
EPTT	>26	26-14	13-0
BI	<6.16	6.16-8.07	8.08-10
SI	>3.07	3.07-1.55	1.54-0

Table 3
Biological Criteria metric values for Warm Water Streams in the Ozark/Little EDU (Fall)

	Score = 5	Score = 3	Score = 1
TT	>81	81-41	40-0
EPTT	>20	20-11	10-0
BI	<6.14	6.15-8.06	8.07-10
SI	>3.3	3.3-1.66	1.65-0

The metric values for Big Creek spring and fall 2000 are listed in Table 4. The values for each metric are scored using the criteria in Tables 2 and 3. The total score in the spring was 14 out of a total of 20 and the total score in the fall was 12 out of a total of 20. Three categories of impairment were determined during the development of biological criteria. Stream reaches that score from 20-16 are considered fully biologically sustaining, scores from 14-10 are considered as partially sustaining, and scores of 8-4 are considered non-sustaining.

Table 4
Metric values for Big Creek, Iron County

Sample #	00-10157		00-10174	
Date	3/27/2000		9/20/2000	
	Spring Value	Spring Score	Fall Value	Fall Score
TT	88	3	65	3
EPTT	25	3	13	3
BI	6.18	3	6.76	3
SI	3.38	5	3.28	3
Total Score		14		12
Sustainability		Partial		Partial

7.0 Discussion

The Big Creek sample site had somewhat impaired macroinvertebrate communities during spring and fall 2000 with partially sustaining biological ratings. Possible reasons for the lowered ratings are input from the Doe Run lead smelter and a railroad and Highway 21 which closely parallels the stream. Another likely reason for the even lower rating in the fall is habitat alteration that occurred between spring and fall sampling. Most of the natural habitats such as riffles were destroyed and the habitats that were sampled were artificially created with very unstable substrate.

The Division of Environmental Quality's Southeast Regional Office in Poplar Bluff was notified of the habitat alteration for further investigation.

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Appendix

Map

Big Creek
Ozark/Little EDU

